

## IMPROVEMENTS IN AND RELATING TO CORRUGATED CARDBOARD PALLETS

### DESCRIPTION

The present invention relates to improvements in corrugated cardboard pallets.

5 Pallets are in everyday use and are usually made from wood, polythene, plastic or metal. The pallets may be of a general size, such as those used in the retail and retail goods manufacturing industries, or they may be made for specific applications. Their chief purpose is to safely store goods or product in quantity and allow the goods or product to be mechanically handled within manufacturing units. The pallets also  
10 act as shipping units, often via vehicle transport, to the retail outlet. Again, at the retail outlet the pallets are mechanically handled and stored prior to transport to individual stores. The pallet may then be used to display the goods or product directly on the shop floor, as a form of merchandising unit.

Pallets are normally of a high initial cost and there are systems of pallet hire in  
15 place. Pallets may also be purchased second hand, but are again costly, and may be prone to contaminants. They are bulky and are normally of a standard height and size so that both the manufacturer and retailer storage systems are compatible. Wooden pallets are heavy to manhandle and add to the crush weight of stored and transported goods or product because often several pallets of goods or product are stored on top of  
20 one another. A standard wooden pallet typically weighs between 25Kg and 50Kg. This means that manhandling is difficult and the weight can damage the goods or product that the pallet rests upon. This type of pallet is also costly to transport because of its inherent weight.

A typical operation of a re-usable pallet may be as follows. Manufactured product such as boxed dry goods are collated and stacked on to a standard wooden pallet. A man may then place a pallet on top of this stacked pallet and proceed to collate and place more boxed product on top of this. Depending upon how many  
5 layers of product are used on each pallet, each single stack may contain several pallets. The stack is then normally enshrouded in stretch wrap to form a unit that is then mechanically handled by a manual pump truck or a mechanical fork lift truck and placed into storage. After a period of time, the product is ordered by a retailer and the unit is mechanically loaded onto a transport vehicle. At the retailer's depot, the unit is  
10 unloaded and stored for a further period. It is then loaded onto another vehicle and delivered into a retail shop, where it may be stored or placed in a display area for merchandising onto the shop floor.

The problem with the aforementioned operation is that the manufacturer does not get the pallet back. This is very costly to the manufacturer and, ultimately, the  
15 consumer. After the product or goods are used from the pallet, the retailer must then dispose of the wooden pallet, which is bulky and heavy. The disposal of the pallet requires expensive transport and is costly to the environment since most pallets end up in landfill. It is estimated that there are around 5 wooden pallets in existence for each person in the British Isles.

20 If a hire system is used, a pallet must be hired by a manufacturer. A system of tracking the pallets is required which is both labour intensive and costly. The pallet is then left with the retailer. The retailer may have a stock of empty pallets which he can give back to the manufacturer, requiring the loading of a vehicle to transport bulky, heavy and empty pallets back to the manufacturer at his own cost. A

manufacturer also has to pay to de-hire a pallet and, if one is lost, will have to pay full cost for it. The returned pallets can be hired out again in a repeat cycle. Re-using pallets also leads to problems of cleanliness and repair. Wooden pallets are normally put together with nails which may become exposed and damage the goods or product placed upon them. Furthermore, wooden pallets may produce large or small splinters that can either damage the product or even enter and contaminate the product, especially food goods.

The standard height of most pallets, usually being about 160mm, dictates how much product can be transported on a vehicle, such as a curtain slider. Wooden pallets are heavy and may double in weight when wet, making manual handling dangerous.

It is an object of the present invention to provide an improved corrugated cardboard pallet, that aims to overcome, or at least alleviate the abovementioned drawbacks.

It is a further object of the present invention to provide a method of manufacture for the production of a corrugated cardboard pallet.

Accordingly, a first aspect of the present invention provides a corrugated cardboard pallet, the pallet comprising a top sheet, a base sheet and at least one connecting member between said top and said base sheets, the connecting member being moveable to shift the pallet between a relatively flat and a relatively erect form.

The provision of a pallet that may be adjusted from a flat to an erect form is preferably provided by means of a number of connecting members being secured between the top sheet and the base sheet. Each member is constructed such as to be moveable from a flattened or collapsed state to an erect state. More preferably, each

connecting member is in the form of a corrugated cardboard support comprising two substantially parallel opposing main body panels and two pairs of opposing side walls wherein each of one pair of opposing side walls are formed from two interlocking parts.

5           The provision of a pair of opposing side walls that are each comprised of two interlocking parts enables the assembled support to be moveable from a collapsed state to an erect state. In the collapsed or flattened state, two parts of each wall are disengaged to allow each part to lie flat against its connecting wall or panel. In the erect state, the two parts of each wall become interlocked and lie substantially  
10           perpendicularly to their connecting wall or panel.

          A corrugated cardboard blank is provided for the construction of each support, comprising two main body forming panels, a middle panel between said body forming panels and at least one end flap, each main body forming panel and middle panel having opposing side flaps, each side flap of the main body  
15           panels being provided with an indent.

          It is to be appreciated that a support is assembled from the blank by folding the appropriate parts of the blank and securing them together using suitable means, most preferably an adhesive. The side flaps of the main panels are secured to the side flaps of the middle panel and the end flap is folded over and secured to the main  
20           panel. However, the side flaps of the main body panels are not secured to each other.

          The provision of an indent in each side flap of each main body forming panel enables a side flap of one main body panel to engage with the adjacent side flap of the other main body panel when the blank is assembled to form an erect box, thereby forming a double blind box. Prior to engagement of the flaps, the box is in a flattened

state. This enables the blank to be assembled into a box that may take on a collapsed or an erect state.

Opposing side flaps of each main body panel are preferably a mirror image of one another. Adjacent side flaps of adjacent main body panels are preferably

5 identical.

Preferably, an end flap is provided at the end of each main body forming panel. More preferably, one of the end flaps is also provided with side flaps. A tab is preferably provided on each of the side flaps of the main body panels for attachment to the side flaps of the end flap and middle panel in the constructed box.

10 Each tab is preferably provided at the remote end of the indented region of each side flap. Preferably, a line of weakness is provided between each tab and its adjoining side flap.

Each side flap of the main body forming panels, middle panel and/or end flap is preferably provided with one corner that forms substantially a right angle and an  
15 opposing corner which is truncated. Each tab provided on the side flaps of the main body forming panels preferably extends from the truncated end of the side flap.

It is preferable for fluting to be formed in the longitudinal direction of the blank, i.e. from one end flap to the other since this increases the strength of the box formed from the blank and thereby imparts strength to the pallet.

20 The main panels and walls of the support may be any desired size.

Preferably, at least four supports as hereinbefore described are provided between the top and base sheet to form the pallet, optionally being of different sizes. More preferably, between nine and twelve supports are provided but the exact number

will depend upon the size of the pallet and on the size of the supports and hence, any number may be provided as desired.

The supports are arranged so as to provide a stable pallet in its erect form and so that there are gaps between adjacent supports to provide side access points to the pallet. Supports may be provided at each corner of the sheets, with a support positioned centrally between the corner supports along each side thereof and a further support being provided in the centre between the sheets. Preferably, the support provided in the centre is the largest size of support and the supports provided at the corners are the smallest in size.

The base sheet is preferably provided with regions that are relieved of material to provide access points from below the pallet. Preferably, two to four regions are relieved of material. However, any suitable number may be provided in the pallet, being formed through the base sheet and/or by the spacing between adjacent supports provided between the sheets of the pallet.

In a preferred embodiment of the present invention, the components of the pallet are secured together by means of adhesive only. A varnish may be applied to the top sheet, base sheet and/or supports to impart water resistance.

Additionally, at least one further sheet, for example a cross ply board, may be laminated to the top and/or base sheet to increase the strength of the pallet.

Preferably, the fluting of the additional sheet lies at 90 degrees to the direction of fluting on the sheet to which it is applied.

A fourth aspect of the present invention provides a method of manufacturing a corrugated cardboard pallet comprising the steps of passing a top sheet along a

conveyor, feeding at least one connecting member on to the top sheet and securing a base sheet to the connecting member.

Preferably, an adhesive is applied to the connecting member prior to feeding it on to the top sheet. Preferably, the connecting member is moveable between a flattened and erect state and is applied to the top sheet in its flattened state.

Generally, a plurality of connecting members will be fed onto different locations on the top sheet. Preferably, the different connecting members are fed from hoppers.

For a better understanding of the present invention and to show more clearly how it may be carried into effect reference will now be made, by way of example only, to the accompanying drawings in

Figure 1 is a plan view of a double-blind box according to one embodiment of the present invention;

Figure 2 is a perspective view of an erect double-blind box according to the present invention assembled from the blank shown in Figure 1;

Figure 3 is a perspective view of a double-blind box shown in Figure 2, shown in its collapsed form;

Figure 4 is a plan view of a top part for a pallet according to one embodiment of the present invention;

Figure 5 is a plan view of the base part for a pallet according to one embodiment of the present invention;

Figure 6 is a perspective view of an assembled pallet according to one embodiment of the present invention utilising the parts shown in Figures 1 to 3, 4 and 5;

Figure 7 is a view of the underside of the top part of the pallet showing the location of the double-blind boxes;

Figure 8 is a schematic plan view of an apparatus for the assembly of a pallet according to one embodiment of the present invention; and

5 Figure 9 is a schematic perspective view of the apparatus shown in Figure 8 illustrating the feed of one type of double-blind box from a hopper.

Referring to Figure 1 of the accompanying drawings, a plan view of a blank 2 for the construction of a double-blind box for forming a support for use in a pallet according to one embodiment of the present invention is illustrated. The blank is cut  
10 from a sheet of corrugated cardboard and creases are inserted into the blank to provide fold lines, represented by broken lines in Figure 1. Heavy dotted lines denote reverse fold lines. The main body forming panels 18, 20 connected by a middle section 19. The two main body forming panels 18, 20 are provided with end sections 17, 21 respectively opposite said middle section 19. Each main body panel  
15 has side flaps 11, 22, 14, 25 extending from each side thereof, each side flap having an indent I. One end of each flap is straight and the other opposing end nearest the indent is oblique. Each oblique end is provided with a tab 12, 23, 15, 26. The middle section 19 is also provided with side flaps 13, 24, one end being straight and the other being oblique. Similar side flaps 16, 27 are provided extending from one end section  
20 21 but the opposing end section 17 is free from flaps.

The blank may be assembled to form a support 10 for a pallet, the support comprising two substantially parallel opposing main body panels (18, 20) and two pairs of opposing side walls (X, Y) wherein each of one pair of the opposing side walls (Y) are formed from two interconnecting parts (11, 14 and 22, 25) to enable the



support to be moveable from a collapsed state to an erect state, as shown in Figures 2 and 3.

To form the box 10, side flaps 11, 22 are folded flat on to the main body forming panel 18 and the tabs 12, 23 are folded back to lie against the side flaps.

5 Glue is then applied to the tabs 12, 23. The side flaps 12, 24 are then folded against the middle section 19. The main body forming panel 18 is then folded against the middle section 19 so that the tabs 12, 23 adhere to their adjacent side flap 23, 24. Side flaps 14, 25 are then folded on to the other main body forming panel 20 and the tabs 15, 26 are folded back to lie against the side flaps 14, 25. Glue is then applied to  
10 these tabs and the side flaps 16, 27 are folded flat against the end section 21. The end section 21 is now folded against the main body forming panel 20 so that the side flaps 15, 27 adhere to their adjacent tab 15, 26 respectively. Finally, glue is applied to the opposing end section 17 which is placed over to stick to the outer surface of the other end section 21 to form an assembled box 10, as shown in Figure 2. The construction  
15 of the box from a blank may be achieved using multi-point machine gluers at high speed.

As mentioned above, the construction of the box 10 is such that it may be provided in a collapsed form (Figure 3) or an erect form (Figure 2). Assembly of the box into its collapsed form requires the side flaps 11, 14, 22, 25 of the main body  
20 forming panels to be pressed inwardly such that they lie against their respective panel. Pushing inwardly the outer surface of the collapsed box, in particular the middle section 19 and end section 17, forces the side flaps away from their panel and the flaps lock together by means of the indent I. This forms a double blind box that is extremely difficult to re-collapse.

It has been found that the provision of fluting in the longitudinal direction C, shown in Figure 1, provides for a much stronger box thus enabling the box to support greater weights. This is opposite to the direction of fluting provided in conventional corrugated cardboard boxes.

5        The direction of fluting and the provision of two blind ends in the box results in the erected box being inherently strong. Prior hereto one end of a box would be openable to enable items to be placed within the box. The box according to the present invention may be used as a support, for example acting as a display shelf to support goods that are for sale. The box has advantages over the prior art supports,  
10    such as its ability to be transported and stored flat until required and its ability to be recycled. It is also made of cheap materials.

A preferred application for a box according to the present invention is in the construction of a pallet wherein a plurality of boxes are adhered to a top and bottom sheet to provide a pallet that is moveable from a collapsed to an erect state. Any  
15    required size of pallet may be provided and the larger the pallet, generally the more boxes that will be used in its construction.

Figures 4 to 7 of the accompanying drawings illustrate one pallet according to the present invention. This embodiment is made from eleven single sheets of corrugated cardboard, which are stamped out as shown in Figure 1, Figure 4 and  
20    Figure 5. A solid rectangular sheet 28 is provided to form the top of the pallet and a further rectangular sheet 29 of substantially the same size is provided for forming the base of the pallet, this sheet having two rectangular sections 40, 42 that are relieved of material.

Nine boxes 30 - 38 according to the present invention are glued in their collapsed form to the underside of the top sheet 28, as shown in Figure 7. This figure details the location of the nine double blind boxes that create the compressive strength of the pallet. In the embodiment shown, there are four different sizes of box for each pallet. A smallest size of box 30, 32, 36, 38 is placed at each corner of the sheet. A largest box 34 is placed in the centre of the pallet. Another size of box 31, 37 is positioned centrally along two opposing faces of the pallet between the corner boxes and yet a further size of box 33, 35 is placed centrally along the other two opposing faces of the pallet. Glue is then applied to the panel 20 of the boxes and the bottom sheet 29 of the pallet is then stuck onto the flattened boxes.

It is to be appreciated that any number of boxes may be used to form the pallet. The boxes may be of an identical or different size.

The pallet may be erected by striking an edge of the pallet on the floor, or by way of machine, causing each of the boxes to move into their erect form thereby popping the pallet into its extended state. Figure 6 of the accompanying drawings illustrates the pallet in its extended state.

The orientation of the fluting on the top sheet may be any direction but the orientation of the fluting with respect of the boxes is important to provide overall compressive strength of the pallet. The positioning of the boxes is such as to provide access for a mechanical forklift along all four edges of the pallet. The boxes are also positioned so that they will always be in the correct position to bear on standard warehouse racking systems. The mechanical handling forks can be introduced at A or B on either edge of the pallet, as illustrated in Figure 6. If a pallet truck is used for

handling, then the wheels roll over the pallet base 29 and then sit against the floor as the pallet is elevated for moving.

An additional sheet (not shown), for example of cross ply board, may be secured to the top and/or base sheet to increase the strength of the pallet. The fluting of the additional sheet is preferably transverse to the direction of fluting on the sheet to which it is applied.

Figures 8 and 9 of the accompanying drawings illustrate one embodiment of an apparatus for the automatic construction of pallets according to the present invention. In the embodiment shown, a pallet is manufactured from eleven pieces of corrugated cardboard that have been stamped out. A top sheet 28 is fed onto a conveyor 100. The top sheet of the pallet may be made from a plurality of walled corrugated cardboard upon the strength characteristics required. It is envisaged that a pallet will normally be used with loads of less than 700Kg but by varying the grammage of the board used, and the type of fluting, it can be made to withstand considerably more weight.

Nine collapsible boxes 10 are fed from hoppers 101 – 104 on to the top sheet. The hoppers are located such that the boxes are positioned in their correct position on the sheet 28. Each flattened box is passed over glue applicator wheel 112 housed within a glue bath 110 and is applied to the underside of the top sheet by means of an applicator wheel 114. A bottom sheet 29 is then fed onto the top of the boxes 10 from a sheet feeder 106 to form a collapsed pallet. The bottom sheet is also of corrugated cardboard having access slots cut into it so the assembled article can be mechanically handled by a pump truck.

The boxes 10 give the pallet its load bearing capability. The boxes are unique double blind boxes with self-erecting ends, as described in Figures 2 and 3. When the sides of the box are pressed inwardly, they form a rigid box that cannot be flattened again. The boxes also have a degree of flexibility so that vibrating movement through them will have a dampened action. No metal staples are used, just glue. When the pallet is un-erected in flat form, the preferred embodiment is only about 25mm thick. In contrast, when the edges are struck on a surface, or pushed together, the pallet pops into a rigid 100mm high pallet. The pallet may be machine erected, as in conventional automated palletising systems, or may be easily hand erected in one motion by striking one edge on the floor.

The absence of any metal mechanical fastenings means that the pallet cannot damage or contaminate any product or goods placed therein. Its reduced height vis-à-vis the conventional type of pallet means that extra product layers may be gained for transport. The cardboard may also be treated with varnish or other suitable means to make it water resistant and may be printed with descriptors or other decoration, such as in for use in a shop display merchandising unit.

The provision of pallets made from corrugated cardboard that are moveable between a collapsed and erect form overcomes many of the difficulties associated with the prior art type of pallets. The pallet may be stored in its flat form, thus potentially giving a 600% saving on storage space over the conventional pallet systems. Transportation prior to use can also be done with the pallet in its flattened form, meaning that fewer vehicles are needed. For example, it is envisaged that 4000 of the pallets according to the present invention will be able to be transported by a single vehicle whereas 11 vehicles would be required to transport the same number of

conventional wooden pallets. Thus, a pallet according to the present invention has clear economical and environmental benefits. Furthermore, once erected, a pallet according to the present invention may only be about 100mm high, being almost half the height of a standard wooden pallet but tall enough to enable handling by all standard mechanical means. The pallet according to the present invention is designed for single trip use. Whilst the pallet is robust enough to be mechanically handled and transported several times, it is envisaged that the pallet will be compacted after use and recycled. In this respect, the pallet is 100% recyclable. This saves on storage space and costly return transport. Furthermore, the pallet is far cheaper to make than other types of wooden pallet currently in existence, minimising the cost to the ultimate consumer.

On average, a pallet according to a preferred embodiment of the present invention weighs about 1-3 Kg. In contrast, a conventional wooden pallet weighs between 25-50Kg. Thus, the present pallet can be manually handled without any worry of health and safety weight constraints. Its lightness also assists in the prevention of product damage when the pallet is used in multi-stacked units. It is designed for two-way or four-way entry and can be handled by a manual pallet pump truck or various mechanical forklift trucks without modification. The pallet is also designed so that it can be placed safely in the majority of racking systems.

A further benefit provided by a pallet according to the present invention is that its basic constructional design can be used to provide any size of pallet required. By varying the grade of corrugated cardboard used, the box or pallet can be made to withstand varying dead loads up to several tons.

Additionally, the provision of a pallet that is intended for a single use reduces the risk of any contamination of the product from the pallet. Wooden pallets require fumigation against wood boring insects. The single use aspect of the pallet also reduces incidental costs associated with the provision of manpower to control the

5 pallets, clean the pallets and store and unload the pallets.